

**REMARKS**

Claims 1-109 are currently pending. Pursuant to a restriction requirement issued December 6, 2000, Applicants elected with traverse to proceed with prosecution of the invention defined in Group I claims 1-43, 79, 87-89, 95-98. If and when these Group I claims are found allowable, Applicants reserve the right to request the amendment of the Group III claims to depend from Group I claims so that they may be rejoined with the Group I claims since the same grounds for patentability of the Group I claims would also impart patentability to the Group III claims. MPEP § 821.04.

Subsequently, pursuant to an election of species requirement, Applicants further elected species (b) graphite fibrils, (c) cylindrical fibrils and (g) structure  $[C_nH_L][R'-R]_m$ , which read on claims 22, 23, 24, 79, 87-89 and 95-98. However, only claims 22-24 and 87-88 are indicated as pending and having been examined (while claim 79 was moved to Group III, there is no explanation for missing claims 89 and 95-98). Applicants respectfully submit that missing claims 89 and 95-98 should be examined on its merits with claims 22-24 and 87-88. In the alternative, claims 89 and 95-98 should be examined along with the other withdrawn claims 1-21 and 25-43 once the currently elected species has been indicated as allowable.

Claims 22-24 and 87-88 have been examined and were rejected under 35 U.S.C. §§ 102(b) and 112, ¶ 1. Applicants respectfully traverse.

A. Applicants' Claims Are Novel Over Bening

In a new ground for rejection, the Office Action asserts that Applicants' claims 22-24 and 87-88 were purportedly anticipated by Bening, et. al. "Surface Chemistry of Fibrillar Carbon" (hereinafter, "Bening"). Applicants respectfully traverse.

As an initial matter, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art

reference. MPEP § 2131. Applicants respectfully submit that Bening fails to teach each and every element in Applicants claims 22-24 and 87-88.

Bening teaches the preparation of oxidized fibrils in which the surface of the fibrils or nanotubes comprise a variety of oxidized groups such as lactones, carboxylic acids, hydroxyl groups, quinones, etc. (“Although the basal planes are quite inert, oxidation results in the introduction of a variety of oxygen-containing functional groups to edges” - p. 420, col. 2, lines 23-24; *also* lines 30-38). These oxidized fibrils are prepared by contacting the fibrils with a strong oxidizing agent such as  $\text{KClO}_3$  in  $\text{H}_2\text{SO}_4$ .

However, Bening does not teach secondary functionalization as claims in Applicants’ claims 22-24 and 87-88 in which the fibrils containing oxidized groups are further reacted with another reactant (as recited in claims 87-88) to add certain additional functional groups to the oxidized groups (*i.e.*, the R’-R group as recited in claims 22-24, the secondary R being added to the originally oxidized R’ group).

As such, Bening does not anticipate Applicants’ claims 22-24 or 87-88, and withdrawal of this rejection is respectfully requested.

**B. Applicants’ Claims Are Enabled**

Claims 22-24<sup>1</sup> and 87-88 were also rejected under 35 U.S.C. § 112, ¶ 1 for purportedly failing to comply with the enablement requirement. As clarified by the Office Action, the enablement rejection is not that Applicants’ specification does not teach how to make the functional groups<sup>2</sup>, but rather, purportedly does not disclose how to attach to the carbon

<sup>1</sup> Although the Office Action recites claims 21-24, Applicants believe that is an error in that claim 21 was withdrawn from consideration. As such, Applicants believe the Office Action was meant to recite claims 22-24 for this rejection.

<sup>2</sup> As argued by Applicants in their previous Response of October 28, 2003, it is well within the purview of one of ordinary skill in the organic chemistry art to synthesize different functional

fibrils certain of the claimed functional groups of claim 22 where R is  $\text{SR}'$ ,  $\text{Si}-(\text{OR}')_3-\text{R}'_{3-y}$ ,  $\text{Si}-(\text{O}-\text{SiR}'_2)-\text{OR}'$ ,  $\text{Hg-X}$ , and  $\text{Mg-X}$ .<sup>3</sup> (Office Action, pp. 2-3). Applicants respectfully traverse.

As applied to this rejection, the test for enablement is whether the experimentation, if any is necessary to attach the aforementioned functional groups to the carbon fibril, is undue. MPEP § 2164.01. The specification preferably omits what is well known in the art. MPEP § 2164.01. Whether such experimentation is undue depends on a number of factors, such as the state of the prior art, the level of one of ordinary skill, level of predictability in the art, the amount of direction provided by the inventor, the existence of examples, the quantity of experimentation needed, etc. MPEP § 2164.01(a). Applicants respectfully submit that the specification is enabling for the examined claims because experimentation, if any is needed to attach the aforementioned functional groups to the carbon fibril (Applicants submit that none is needed), is not undue. This conclusion is supported by Applicants' specification.

As an initial matter, Applicants' specification teaches generally how to attach functional groups to the carbon fibril:

The invention is also in methods of introducing functional groups onto the surface of carbon fibrils by contacting the carbon fibrils with a strong oxidizing agent for a period of time sufficient to oxidize the surface of said fibrils, and then contacting said fibrils

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groups based on the teachings of the Applicants' specification. There are numerous examples disclosed in the specification which teach how to functionalize the nanotubes, including with functional groups made from or containing sulfuric acid, silane, and metals, oxides, etc. (Specification, pp. 19-48). Applicants' examples even disclose a number of textbooks (*e.g.*, March, J.P., Advanced Organic Chemistry, 3rd Ed. Wiley, NY 1985; House, H., Modern Synthetic Reactions, 2nd Ed. Benjamin/Cummings, Menlo Park CA 1972) for one of ordinary skill in the art to further review if he/she so wishes.

<sup>3</sup> Applicants note that this basis does not apply to claim 87-88 and that no other reason was provided as to why claims 87-88 were not enabled - thus withdrawal of this rejection for claims 87-88 is respectfully requested.

with a reactant suitable for adding a functional group to the oxidized surface. In a preferred embodiment of the invention, the oxidizing agent is comprised of a solution of an alkali metal chlorate in a strong acid. In other embodiments of the invention the alkali metal chlorate is sodium chlorate or potassium chlorate. In preferred embodiments the strong acid used is sulfuric acid. Periods of time sufficient for oxidation are from about 0.5 hours to about 24 hours. (Specification, p. 16, lines 12-24).

Applicants furthermore specifically teach methods of functionalizing fibrils, which includes how to attach functional groups to carbon fibrils. For example, Applicants teach that functional groups may be attached to carbon fibrils by sulfonation, electrophilic addition to deoxygenated fibril surfaces or metallation. (Specification, p. 18, lines 15-21). A number of examples of illustration how to employ sulfonation (pp. 19-21), additions to oxide-free fibril surfaces with a variety of acids (pp. 21-25), or metallation (pp. 25-29) processes are disclosed. Further teachings and examples on how to employ adsorption (pp. 29--31), chlorate or nitric acid oxidation (pp. 32-35) or further derivative experiments (pp. 35-42) are also disclosed. Methods of preparing secondary derivatives of functionalized fibrils are also disclosed (pp. 35-44). Thus, there is considerable amount of guidance, direction and examples provided to one skilled in the art on how to attach functional groups to the carbon fibril.

Furthermore, since, as the Examiner admits, the specification is enabling for teaching one skilled in the art how to attach to carbon fibrils the functional groups of claim 22 where R is  $\text{SO}_3\text{H}$ ,  $\text{COOH}$ ,  $\text{NH}_2$ ,  $\text{OH}$ ,  $\text{CHO}$ ,  $\text{CN}$ ,  $\text{COCl}$ , halide,  $\text{COSH}$ ,  $\text{SH}$ ,  $\text{COOR}'$ ,  $\text{SiR}'_3$ ,  $\text{R}''$ ,  $\text{Li}$ ,  $\text{AlR}'_2$ , and  $\text{TiZ}_2$ , it logically follows that one of ordinary skill in the organic chemistry art would also be able to attach to carbon fibrils the other functional groups of claim 22 where R is  $\text{SR}'$ ,  $\text{Si}-(\text{OR}')_y-\text{R}'_{3-y}$ ,  $\text{Si}-(\text{O}-\text{SiR}'_2)-\text{OR}'$ ,  $\text{Hg-X}$ , and  $\text{Mg-X}$  (whether or not Applicants' specification teaches this specifically) since these chemical reaction and substitution procedures are well known in the art. Coupled with Applicants' teachings as explained in the preceding

paragraph, Applicants thus respectfully submit that claims 22-24 and 87-88 are enabled by the specification and respectfully request withdrawal of this rejection.

Such analysis is consistent with and supported by the conclusion in *In re Wands*, 858 F.2d 731, 737, 8 U.S.P.Q.2d 1400, 1404 (Fed.Cir. 1988). Like the facts of *Wands*, there is considerable direction and guidance in the specification, there is a high level of skill in the art, and all of the methods needed to practice the invention were well known. As such, it would not require undue experimentation to attach the claimed functional groups to carbon fibrils. *In re Wands*, 858 F.2d at 740, 8 U.S.P.Q.2d 1407.


Applicants further respectfully request, upon allowance of a generic claim, that all of the elected Group I claims (*i.e.*, claims 1-43, 79, 87-89 and 95-98) be considered for examination on the merits.

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Respectfully submitted,

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